

7.0 Preventing Falls on Steps and Stairs



Falls on steps and stairs, even short flights, can result in serious injuries and even fatalities. Key to preventing this is good stair design that reduces the risk of human error.

Introduction

For many historic properties, stairs will have been made to the design standards in place at the time they were built. In many cases, this could mean outdated standards or none at all. There is also a likelihood that the expected use of the stair has changed over time. For example, an infrequently used domestic stair at the time of construction may now be part of a visitor attraction open to the public. Clearly, this may increase the risk of falls as the stair is used more often and by people who may struggle to use it safely. Whilst the information presented here focuses on traditional stairs, the principles would apply to all indoor and outdoor stairs, including access to stages, pulpits and even vehicles.

Whilst building regulations in the UK are not retrospective, and many stairs in historic properties will not be in breach of health and safety law, there may still be an unacceptable risk of falls to stair users. Ideally, all stairs should be looked at to determine if they are safe or if suitable improvements can be made to them where necessary. Even subtle design changes can really help with the prevention of falls.

Stair design guidance is set out in BS 5395-1:2010, Stairs: Code of practice for the design of stairs with straight flights and winders and Approved Document K: Protection from falling, collision and impact of the Building Regulations.

A stair can be visually appealing without compromising its safety. Even stairs in listed buildings can be subtly and simply modified where necessary to reduce the risk of falls. Some very high-profile listed buildings have reduced the risk of falls significantly on steps and stairs by making simple changes to the design.

Lighting levels on stairs are also important, as discussed in module 5.3, Preventing slips: Environment. Account should also be taken of varying levels of light available at different times of day and different times of year, especially on external stairs.

Other important considerations include the availability and design of handrails, the dimensions of stair treads and the design of the stair treads. These are considered in more detail below.

Handrails

Handrails on stairs serve three important functions:

- They act as a visual and tactile guide to help people use the stair safely.
- They provide a means of support to help elderly and/or infirm people climb the stairs.

- They give people an opportunity to prevent a fall if they should lose their balance.

In order to do this, handrails need to be well designed. And, if handrails are going to be installed in a listed building, the design should be made in consultation with the relevant Conservation Officer.

Best practice

These include:

- **A stair should have a handrail on each side** unless this would reduce the width of the stair to less than 1,000mm. An additional central handrail is required where the width of the stairs is more than 1,800mm wide.
- **A well-designed handrail should follow the pitch of the stair and be mounted** so that the top of the rail is between 900mm and 1,000mm above the edge of each tread. A handrail that is mounted much higher than this may be more difficult to grasp predictably if someone loses their balance. A handrail that is mounted much lower than this will be easier to fall over, leading to the risk of a significant fall.
- **Handrails need to be graspable** so that people can use them to successfully arrest a fall. A graspable handrail should:
 - have a minimum of 50mm clearance from nearby walls and mounting points to allow room to grasp the rail
 - have no other obstructions or design features that prevent the rail from being grasped, for example nearby pipework or studs on the rail itself
 - have a perimeter of 100mm to 160mm (for example a circular rail with a diameter of 32mm to 50mm). A rail of this size allows a user to form a power grip (where the fingers and thumb meet on the opposite side of the rail to the palm). This can generate enough strength to stop a fall. A handrail with a larger profile, even one that is comfortable to hold, will prevent a power grip making it a lot less effective in preventing a fall
 - extend 300mm beyond the first or last riser.
- **Handrails should contrast clearly** with the surrounding environment.
- **Handrails should extend the entire length of the flight of stairs.**
- **Guarding on landings should be at least 1,100 mm high** to reduce the risk of people falling over the edge. In buildings that may be used by children under the age of 5 years, the guarding on the stair should not have any openings that allow a 100mm sphere to be passed through. It should also discourage climbing.



Good use of handrail that runs the full length of access routes, plus clear nosings and a ramp.

Challenges for historic properties

Handrails in some historic buildings are more likely to be mounted less than 900mm above the stair. Frequently, they may have a larger profile than handrails installed to meet modern building regulations.

This makes them harder to grasp successfully and less effective at preventing falls. Where the handrail acts as edge protection on the stair; a low handrail also increases the risk of a fall over that side of the stair.

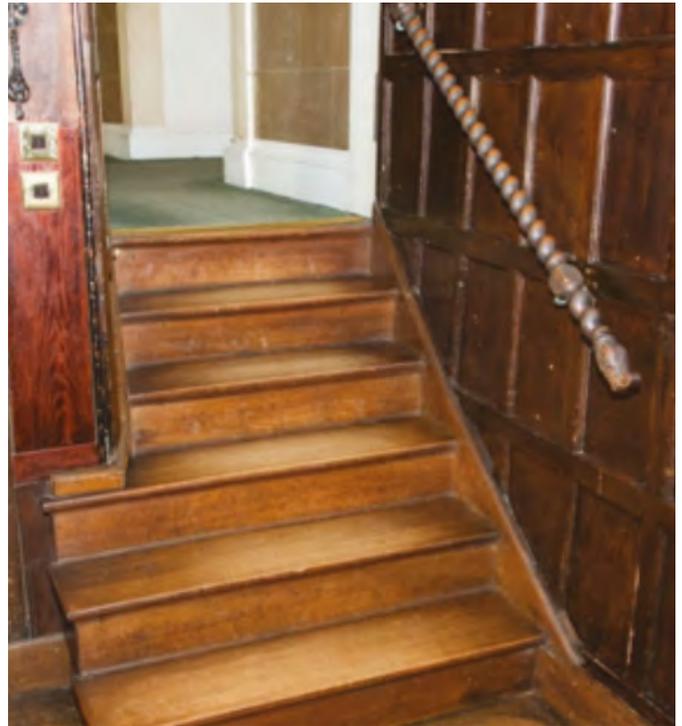
In many cases, handrails can restrict already narrow stairs further and many two-way stairs may only be fitted with a hand rail on one side. Retrofitting handrails can also cause further problems as it is often difficult to provide appropriate fixings without damaging the historic fabric of the walls.

In some premises, the guarding on landings, balconies etc. is below 1,100mm.

Other possible solutions

These include:

- Balance the need to retrofit handrails taking account of other factors (e.g. the proximity of other means of access, such as lifts).
- Where the installation of a handrail is proposed, planning correctly with appropriate consultation to ensure that its historic impact is understood and agreed.
- Insert an additional rail where the handrail does not extend sufficiently or have an adequate profile.
- Provide a single, central handrail where a handrail cannot be provided on both sides.
- Avoid using rope or chain as a rail wherever possible, using a rigid, fixed handrail as this is more likely to be more graspable and less likely to move when relied upon for support.
- Where new rails or modifications to existing rails are being considered, looking at the handrails in other parts of the premises. A safe design should be achievable.



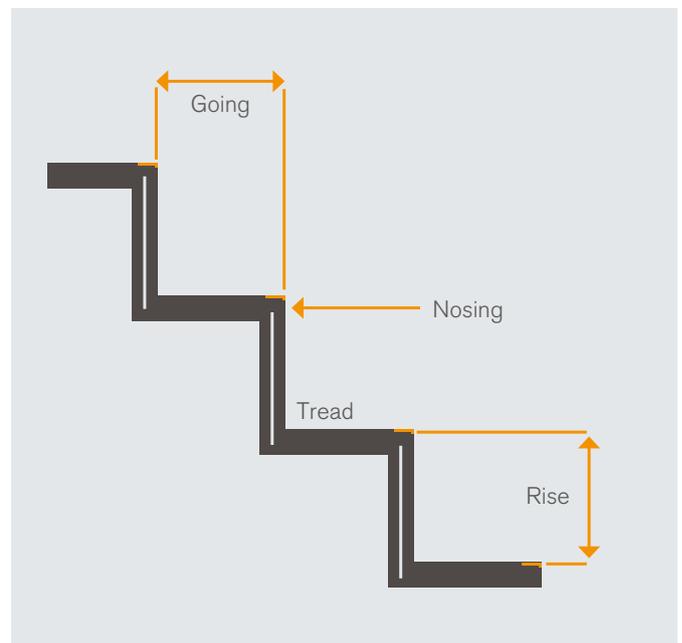
Attractive and successful historic handrail design

Dimensions of stair treads

The size of stair treads affects how likely someone is to fall. The depth of the tread, or going, is the most important; the smaller the going, the more likely a person's foot is to overhang the edge of the step a long way. This can lead to a fall.

The height of the tread, or rise, also influences the risk of a fall; the higher the rise the more effort is needed to climb the stair and the less control a person has when walking down the stair.

Any difference in the size of adjacent stair treads makes a fall more likely. This is because people naturally expect the stairs to have consistent dimensions. This is not something people normally think about consciously. Even small inconsistencies of a few millimetres between adjacent treads can significantly increase the risk of someone misplacing their foot and falling.



Best practice

These include:

- **Review the adequacy of modern stairs** and ensure that the dimensions are suitable and consistent.
- **Ensure modern stairs have a going of at least 250mm** - with goings of 300mm being even better for reducing fall risk. Rises should not be more than 190mm high.
- **Rises and goings should be consistent throughout the stair.** Even a 5mm difference in size between adjacent goings makes a big difference to the risk of a fall.
- **Where inconsistencies are identified** - the stair is evened out by adding small amounts of material to the rises and goings. This does not normally need to change the overall footprint of the stair.

Challenges for historic properties

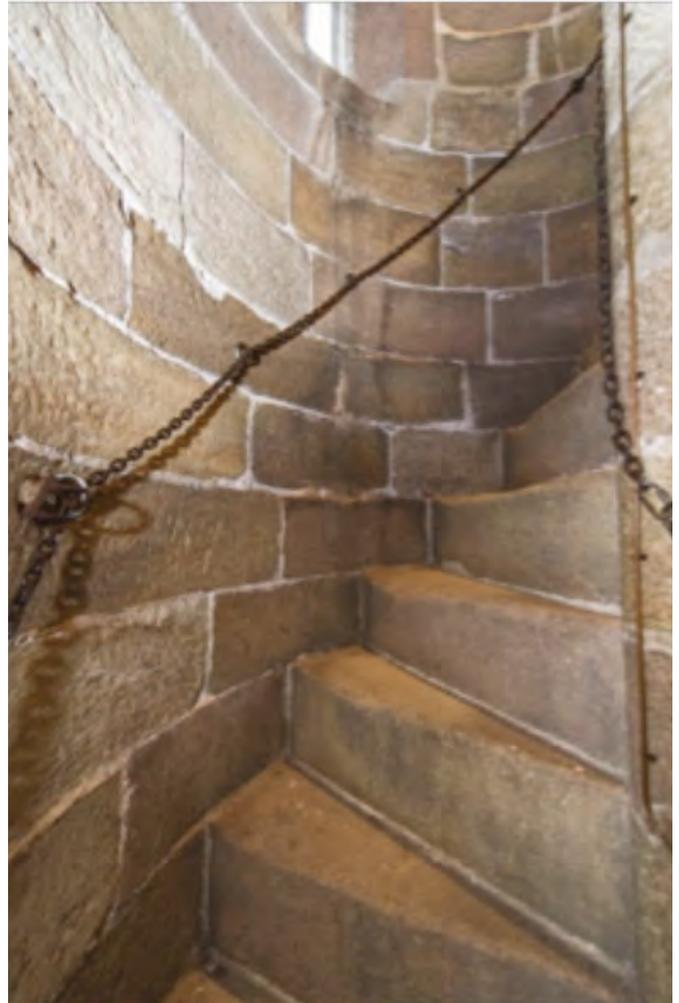
Many stairs in historic properties will have treads with small goings and/or large rises. They may also have inconsistent dimensions, either as a result of poor design, construction or as a result of wear.

Stairs that were once used as occasional access to quiet areas of a building may now be open to members of the public. This increases the amount of people exposed to the risk and the chance that some of them will find using stairs difficult.

Other possible solutions

These include:

- Where stairs have worn (e.g. stone or concrete steps which have 'dished' in the middle), consider new stone that can be installed at the edge of the treads to level them off, if a contrasting colour of stone is used this will also help to highlight the nosing. For many historic properties, this will only be considered as last resort after appropriate consultation with those who would give approval.
- Where historic stairs have challenging dimensions or are inconsistent, and modifications to the stair are not possible, ensure that other design features, such as the nosing highlight and handrail, are well designed.
- Provide and maintain appropriate levels of lighting.
- Advise wardens, guides or others who may be on hand to inform visitors of any significant challenges that they might encounter when using the stair.
- Provide accessible information for visitors warning of any challenging areas and access issues. For example, this information can be highlighted on a website.
- Use a one-way system for access where stairs are particularly narrow.
- If stairs to some parts of the premises are particularly challenging to use, consider providing other means of viewing these areas (e.g. a webcam or short video showing the area of site accessed by the stair). This gives people the option to view these parts of the site without having to use stairs they are not confident on.



Using a one-way system for access where stairs are particularly narrow can reduce the risk of falls.

Design of stair treads

Stair treads need a clear highlight at the edge of the tread (or nosing). This reduces the risk of people misplacing their feet when using the stair and losing their balance. The material, position and contrast of this highlight are all

important in order for this to be effective. However, providing clearly highlighted stair treads can be a particular challenge for historic properties.

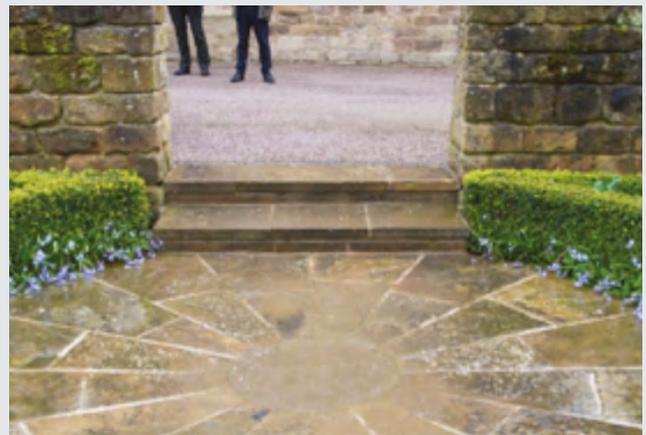
Best practice

Stairs should have a contrasting nosing to highlight the edge of each tread. A well designed nosing highlight should:

- **Provide a minimum of 30 LRV (light reflectance value) contrast** between with the tread it is on and the tread or floor below (see [module 6.3, Preventing trips: Walkways, highlighting trip hazards](#)).
- **Be present at the very edge of the tread.** A highlight set back from the very edge gives a misleading impression of where a person is to place their feet.
- **Extend across the entire width of the tread.**
- **Be approximately 50mm – 60mm deep** to give suitable definition without covering a significant amount of the tread itself.
- **Provide suitable slip resistance** if the stair is likely to become contaminated in normal use (e.g. an outside stair). See [module 5.1, Preventing slips: Flooring](#) for more information on determining the slip resistance of flooring materials.
- **Be well lit for the highlight to be effective.** Even a highlight providing 30 LRV contrast can be ineffective in low light. Consideration should be given to lighting levels at different times of the day and at different times of the year, especially on outdoor stairs.



Concealed steps



Same steps from another angle

Challenges for historic properties

Many stairs in historic properties will have poorly defined nosings. Sometimes this will be compounded where the stairs have become worn.

In many cases, people accessing the site will be elderly, many of whom may have visual impairments or other disabilities and the risk of missing their step on stairs is increased for them.

Other possible solutions

These include:

- Staining wooden stair nosings a lighter or darker tone (depending on their surroundings).
- Using a contrasting stone on the nosings of stone steps taking account of any relevant conservation requirements.
- Painting the highlight in an attractive colour that provides suitable LRV contrast, for example, using the main colours from an attraction's sign or logo as a highlight colour where suitable.
- Installing LED lighting in stair risers or under handrails in order to light stairs effectively. Using LED lighting reduces the need to replace bulbs, but it may be necessary to check that bulbs can be changed easily.
- If stairs to some parts of the premises are particularly challenging to use, providing other means of viewing these areas (e.g. a webcam or short video showing the area accessed by the stairs). This gives people the option to view these parts of the site without having to use stairs they may not be confident on.



Effective nosing highlight

Need to contact us?

For further advice Ecclesiastical customers can call our Risk Management Advice Line on **0345 600 7531** (Monday to Friday 09:00 to 17:00, excluding Bank Holidays) or email us at risk.advice@ecclesiastical.com and one of our experts will call you back within 24 hours.

